

SUDDEN
INFANT
DEATH
SYNDROME

BY RONALD A. STODDARD, M.D.

RECENTLY I HAD THE SPECIAL EXPERIENCE OF HOLDING MY FIRST GRANDCHILD IN MY OWN ARMS.

Jason Landon Beutler was born on October 3, 1998 at Alta Bates Hospital in Berkeley, California. He is a healthy full term infant with light blonde hair and baby blue eyes. Although my wife and I have had five children of our own, the feelings that I experienced in holding the first of a new generation in our family were very tender and unique. The months of pregnancy for my daughter were not easy ones for me and I worried more about the well-being of my grandchild than I had about the births of our own children. My study of neonatology had made me very aware of the many things which could go wrong in pregnancy and delivery. It was such a relief to have him born at term and without any significant problems or complications.

As I rocked this precious child and considered the miracle of birth, many thoughts flooded my consciousness. What would my grandson achieve in life? Would he be a productive, happy, loving individual? Would he love sports and excel in basketball like his father? Would he become a lawyer like his father or would he choose a field in medicine like his mother? Most of his life would be in a new millennium — what would happen in the world during the course of his lifetime? Would he have the wisdom to obey his parents and follow a living prophet? Where would he serve his full-time mission?

In the midst of these pleasant thoughts, something very troublesome came to my mind. What if Landon did not live to be an adult? What if he did not survive infancy? He certainly appeared to be a healthy young man with no life-threatening problems, but my medical knowledge would not allow me to be completely comfortable with that information. For the past twenty years of my professional career my interest has been captured by a devastating problem. This "disease" often affects healthy term infants without warning and is called crib death or sudden infant death syndrome (SIDS). It strikes without warning, leaving families with crumbled hopes and dreams.

SIDS has been defined as "the sudden death of any infant or young child, which is unexpected by history, and in which a thorough postmortem examination fails to demonstrate an adequate cause for death."¹ The average birth weight of babies who die of SIDS is six and one half pounds; male infants have a 50% increased risk compared to females; it occurs most commonly between two and four months of age; and it has a seasonal peak during the winter months.² These factors weighed heavily on my mind since my grandson weighed six pounds eleven ounces at birth and would be two to four months of age

during the winter months.

Over the years, few areas of medicine have been studied as well as SIDS. After the neonatal period, it is the most common cause of death in the first year of life. The incidence varies in certain areas of the world and with certain ethnic groups, but it generally has been about 1.5 to 2.0 per thousand live births in the United States (more than 7,000 deaths/year).³ Literally thousands of papers have been published on the subject describing the epidemiology and pathophysiology of SIDS.

Some of the maternal and antenatal risk factors include:

1. Intrauterine hypoxia.
2. Maternal infections during pregnancy.
3. Maternal cigarette smoking and drug use.
4. Low socioeconomic and educational status.
5. Young maternal age and short interpregnancy interval.
6. Having a previous child with SIDS.

Neonatal risk factors include:

1. Prematurity and fetal growth retardation.
2. Being two to four months of age during the winter months.
3. Not breast feeding.
4. Signs of a preceding mild illness.
5. Prone sleeping position
6. Over bundling and overheating.

For some time it was feared that immunizations may cause SIDS, but studies have confirmed that there is no statistical association, and the relationship is coincidental because immunizations are standardly given at the time when the incidence of SIDS is the highest.⁴

In the 1960s and 1970s, the apnea hypothesis for the cause of SIDS originated. Since that time, organizations and individuals studying SIDS and apnea have worked together trying to define the association and causation. Certain infants who experience an apparent life threatening event (ALTE), are at high risk for the recurrence of such events and possibly SIDS. ALTE is a frightening event with some combination of apnea, color change, limpness, choking, or gagging. The observer fears that the infant has either died or is close to death. These events require careful evaluation and home monitoring for a period of time if no etiology is found.⁵ Unfortunately, screening studies to look for abnormal breathing patterns have not consistently identified infants who would die of crib death. Many have argued that home monitoring has never been proven to decrease the incidence of SIDS, but despite the increase in survival of

APPROPRIATE SLEEPING POSITION



INAPPROPRIATE SLEEPING POSITIONS



smaller and sicker premature infants (a population with a higher risk for SIDS), there has never been an increase in the incidence of SIDS. Although there is continued controversy concerning the role of home monitoring, it has been a blessing to most families where there is a real or perceived concern about the infant.

As SIDS was studied more intently in the 1970s and 1980s, it became apparent that there were multiple subtle findings at autopsy that indicated that these infants may not be entirely healthy as was originally thought. Multiple tissue markers of hypoxia and hypoxemia were found and it became more apparent that SIDS may be the consequence of subtle physiologic defects present at birth rather than a single catastrophic event.⁶ This information, along with the knowledge that SIDS does not usually occur in the first month of life, led to the "trigger" theory of SIDS. Simply stated, this is the hypothesis that antenatal hypoxia leads to microscopic injury to the respiratory center of the brain. This same injury would be responsible for the pathologic markers so often seen at autopsy in SIDS infants. The injury would be subclinical until the infant's body is faced with a stress (such as a mild infection which would be more common in the winter months). In the face of the stress, the damaged respiratory center fails to maintain adequate respirations and the infant dies during sleep. This would also explain the fact that infants are spared during the first month of life since the levels of maternal antibody would be protective of infection in the newborn, thus preventing the "trigger".

With this information, medical recommendations for the prevention of SIDS during the 1980s became:

1. Avoid anything that would cause hypoxia in the pregnant mother (smoking, infection, low blood pressure, etc.)
2. Plan conception for mid-summer (thus the infant would be born in the spring)
3. Avoid crowds and exposure of the newborn infant.⁷

Despite intense study and well intended recommendations, the incidence of SIDS remained fairly constant for decades. In the late 1980s, information became available that placing infants in the supine position (on their backs) might decrease the incidence of SIDS.⁸ In the United States, these articles were met with great skepticism because the studies were done in countries where the incidence of SIDS was much higher than in the U.S. Placing infants on their back in these countries dropped the incidence of SIDS to rates similar to those in the U.S. where virtually all babies were placed prone (on their tummies). Researchers in the United States were very concerned about an epidemic of aspiration if all infants were placed supine. It was also noted that the countries where the supine positioning was shown to be most effective were countries where natural fiber bedding was used which may have "suffocated" some of these infants when placed prone. Even after the American Academy of Pediatrics came out with its statement in 1992 that all infants should be placed on either their side or back to sleep, many medical professionals in the United States were not convinced that it would have an impact.⁹

In the early 1990s a very large, well done study of SIDS was published by Dr. Peter Fleming from Bristol, Avon County, England.¹⁰ This study contained compelling data on the association of three important factors with SIDS:

1. Prone sleeping position
2. Over bundling of the infant.
3. Cigarette smoke in the infant's environment.

In this county-wide study with a population the size of the state of Utah, he showed that not only were these factors associated with SIDS, but after launching a campaign to place infants supine, not over bundle them, and keep cigarette smoke out of the environment, he was able to drop the SIDS rate by 70%. There was a drop from 1.5

EVEN AFTER THE AMERICAN ACADEMY OF PEDIATRICS
CAME OUT WITH ITS STATEMENT IN 1992 THAT ALL INFANTS
SHOULD BE PLACED ON EITHER THEIR SIDE OR BACK TO SLEEP,
MANY MEDICAL PROFESSIONALS IN THE UNITED STATES WERE
NOT CONVINCED THAT IT WOULD HAVE AN IMPACT.

AS DR. FLEMING'S RECOMMENDATIONS HAVE BEEN IMPLEMENTED THROUGH THE "BACK TO SLEEP" CAMPAIGN LAUNCHED IN THE EARLY 1990s, THE SIDS RATE HAS DROPPED DRAMATICALLY NATIONWIDE. IN 1990, 75 BABIES DIED OF SIDS IN UTAH. DESPITE INCREASED NUMBERS OF BIRTHS, ONLY 22 INFANTS DIED OF CRIB DEATH IN UTAH IN 1996.

deaths per thousand live births per year to 0.5 deaths per thousand live births per year. After Dr. Fleming's data became known in the United States, the skeptics vanished and a nationwide campaign was launched to educate the medical community and parents about the importance of these factors. Dr. Fleming did not find that the side-lying position was protective.

As Dr. Fleming's recommendations have been implemented throughout the world, the results have been remarkable. When I came to Utah in 1986, we consistently had 75 to 80 babies die each year of SIDS. With the "Back to Sleep" campaign launched in the early 1990s we have seen a dramatic drop in the SIDS rate in this state as well as nationwide as more people are placing infants supine. There has been a steady fall in the number of crib deaths every year in the state of Utah. In 1990, 75 babies died of SIDS in Utah. Despite increased numbers of births, only 22 infants died of crib death in Utah in 1996.

Infants need to be in the prone position some of the time during waking hours for optimal neuromotor development and to prevent flattening of the back of the skull. The supine position is for the times when the infant is put down to sleep. Although we don't entirely understand the mechanism for how supine positioning helps prevent SIDS, we do know that it works. Many babies are alive today because of caretakers who follow these recommendations:

1. Always place your baby on its back to sleep.
2. Do not over bundle your infant.
3. Do not allow anyone to smoke in your baby's environment.

Although I cannot be assured that my grandson will not die of SIDS, it is a great comfort to me that he was born in 1998 when we have the knowledge of supine positioning. In an era of high-technology medicine

where we deal daily with expensive tests and equipment, it is amazing that something as simple as placing an infant on his back to sleep can have such a dramatic impact on his survival.

Ronald A. Stoddard, M.D. is a neonatologist at Utah Valley Regional Medical Center in Provo, Utah.

REFERENCES:

1. Guntheroth WG. Crib Death: The Sudden Infant Death Syndrome. 3rd ed. New York: Futura Publishing Co; 1995.
2. Hoffman HJ, Damus K, Hillman L, et al: Risk factors for SIDS. Results of the National Institute of Child Health and Human Development SIDS Cooperative Epidemiological Study. *Ann N Y Acad Sci* 533:13, 1988.
3. Iyasu S, Lynberge MC, Rowley D, et al: Surveillance of postneonatal mortality, United States, 1980-87. *MMWR CDC Surveill Summ* 40:43, 1991.
4. Hoffman HJ, Hillman L: Epidemiology of the Sudden Infant Death Syndrome: Maternal, Neonatal, and Postneonatal Risk Factors. *Clin in Perinatology* 19:4, 717, 1992.
5. Steinschneider A, Richmond C, Ramaswamy V, Curns A: Clinical Characteristics of an Apparent Life-Threatening Event (ALTE) and the Subsequent Occurrence of Prolonged Apnea or Prolonged Bradycardia. *Clin Pediatr*. 37:223, 1998.
6. Valdes-Dapena M: A pathologist's perspective on the sudden infant death syndrome--1991. *Path Annual* 27:133, 1992.
7. Hunt C: The cardiorespiratory control hypothesis for sudden infant death syndrome. *Clin in Perinatology* 19:4, 757, 1992.
8. Dwyer T, Ponsonby A-L, Gibbons LE, Newman NM. Prone sleeping position and SIDS: evidence from recent case-control and cohort studies in Tasmania. *J Paediatr Child Health* 27:340, 1991.
9. Positioning and SIDS: AAP Task Force on Infant Positioning and SIDS. *Pediatrics* 89:1120, 1992.
10. Fleming PJ, Wigfield RE, Berry PJ, Rudd PT, Golding J. Can the fall in Avon's sudden infant death rate be explained by changes in sleeping position? *Br Med J* 304:282-283, 1992